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CONSOLIDATED VULTEE

UNCLASSIFIED

DIVISION San Diego

MODEL XFY-1

REPORT CVAL 96

DATE 1-18-52

[redacted]

TITLE

Report CVAL 96

LOW-SPEED WIND TUNNEL TESTS OF A .15 SCALE POWERED MODEL OF THE XFY-1 AIRPLANE

(Tested 10-4-51 & 10-19 to 11-1-51)

SUBMITTED UNDER
NAVY CONTRACT NOa(s) 51-936

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GROUP Wind Tunnel

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4	2-7-52		Navy, Bureau of Aeronautics	
5	2-7-52		Navy, Bureau of Aeronautics	
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SUMMARY (Cont'd)

Hovering tests were made by mounting the model in the hovering attitude (see Photo Nos. 7 and 8) and varying the tunnel speed to simulate a crosswind. Several points were taken at each crosswind setting to investigate the aerodynamic spread of force and moment components. Model thrust was held constant during all hovering runs.

The thrust was developed by a controllable-speed electric motor driving scale size contra-rotating propellers. The motor-propeller combination was calibrated for T_c' vs RPM and model angle as shown in Figures 1, 2 and 3. During level and transitional flight, thrust was set and held constant during a run by varying the model motor RPM for each change in angle of attack. The range of T_c' settings was determined from full scale performance data and was chosen as representative of the flight range under investigation.

Results

All data are presented in coefficient form in Figures 4-57. Moment data were transferred to the center of moments located at 15% of the mean aerodynamic chord and .15 inches model scale above the wing reference plane, see sketch page 7. Upwash vane photographs were taken on runs 3 and 4 for investigation of propeller upwash effects but are not presented. Pictorial tuft data showing the wing stall pattern are presented for the transitional flight condition with three power settings in Photo Nos. 13-18. Additional tuft photographs for transitional flight at other power settings and all upwash vane photographs are on file at the Convair Wind Tunnel.

Level Flight Data

In general, only the primary components of force data are presented for the level flight runs on Figures 4-20. These data are presented in coefficient form and are referred to stability axis notation as shown on page 17. Force coefficients are based on wing area and pitching moment coefficient on wing area and mean aerodynamic chord. Rolling and yawing moment coefficients are based on wing area and span. Wall corrections based on unswept wing theory, were applied to angle of attack and drag data. An aerodynamic tare, due to the interference effect of the support windshield, was determined for a limited set of model conditions, see Photo No. 12. This tare was applied to all level flight data. Free stream dynamic pressure was corrected for blocking effects based on the frontal area of the model.

Transitional Flight Data

Only the primary components of the data for transitional flight are presented. All of these data are referred to body axes and are

SUMMARY (Cont'd)

presented in Figures 30-47. In addition, a portion of these data have been referred to stability axes and are presented in Figures 21-29. The NACA sign convention for body axes is used where normal force is positive down and axial force positive forward, see sketch page 18. Force and moment coefficients are based on the same terms used for level flight data. Wall corrections were not known for the transitional flight condition and were not applied. An estimated aerodynamic tare to correct for the interference effect of the support windshield on the model was also applied. Blocking effects for the determination of free stream dynamic pressure were based on model frontal area.

Hovering Flight Data

Hovering flight data are presented in six component form and are all referred to body axes. NACA sign convention for body axes is used, see sketch page 18. Hovering data are plotted as a function of the ratio of crosswind velocity to the theoretical slipstream velocity in Figures 48-57. The dynamic pressure of the propeller slipstream is used as a basis for all force and moment coefficients. This was considered to be model thrust divided by propeller disk area. In addition, force coefficients are based on the model wing area and pitching moment coefficient on wing area and mean aerodynamic chord. Rolling and yawing moment coefficients are based on wing area and span. No wall corrections or aerodynamic tares were applied to hovering data. Blocking effects for correction of free stream dynamic pressure were based on model frontal area. The crosswind velocity, in this connection, could not be accurately determined since adequate information on both tunnel blocking and tunnel calibration in the low speed range (0 to 45 mph) was not available.

SUMMARY

Introduction

This report contains data from low-speed wind tunnel tests of a powered .15 scale model of the XFY-1 airplane. The tests were conducted in the 8- by 12-foot test section of the Convair Wind Tunnel during two periods, on October 4, 1951 and from October 19 to November 1, 1951. This test was authorized under Navy Contract NOa(s) 51-936. The complete test was accomplished in 158.5 wind tunnel hours.

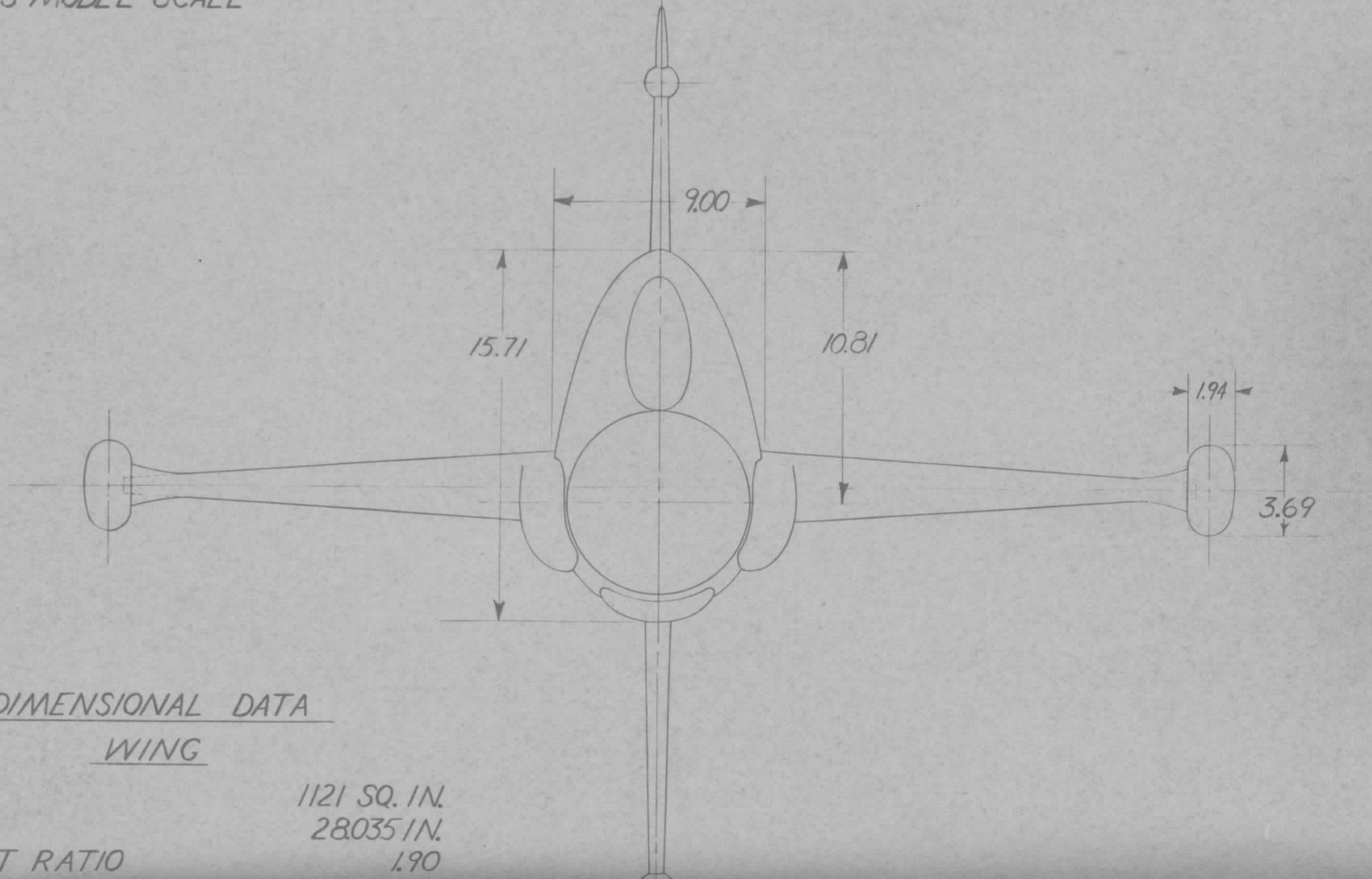
The purpose of these tests was to obtain basic stability and control characteristics for the XFY-1 model during level flight, transition, and hovering flight conditions. Hovering flight was investigated both in free air and in close proximity to the ground. An analysis of these data is presented in CVAC Memo Nos A-5-25 and A-5-26. Runs were made at dynamic pressures of 0 to 63 lb/sq ft. The two basic configurations tested, which consisted of all major airplane components, include; wing, body, vertical tails, propellers, gun pods, oleos and oil cooler. The level flight configuration consisted of the above mentioned components with the pilot's canopy closed. The transition and hovering configuration was the same as level flight except that the pilot's canopy was open. The model was in good condition during the test.

Model Support and Methods

The model was supported by a special "L" shaped strut and sting which was entirely shielded (see Photo No. 5). Pitch runs were made by yawing the balance system after the model was rotated 90° about its longitudinal axis to the position shown in Photo Nos. 1 and 2. Yaw runs were accomplished with the wings level. Six component data were recorded for all pitch and yaw runs. The support strut was designed with an adjustable yoke at the knee so that the model could be pitched at constant angles of yaw and yawed at constant angles of pitch. This was accomplished thru a series of holes on the vertical support strut which allowed adjustment of the horizontal sting to various angles, see sketch on page 6. Data was recorded for various ranges of angles depending on the flight condition. Ranges of each condition are listed below.

Level Flight	Pitch	-2° to 28°
	Yaw	-2° to 28°
Transition Flight	Pitch	0° to 100°
Hovering Flight (with crosswind)		
Crosswind tending to increase angle of attack	V_z/V_{s_∞}	$=0$ to .376
Crosswind tending to increase angle of yaw	V_y/V_{s_∞}	$=0$ to .376

ALL DIMENSIONS ARE
INCHES MODEL SCALE

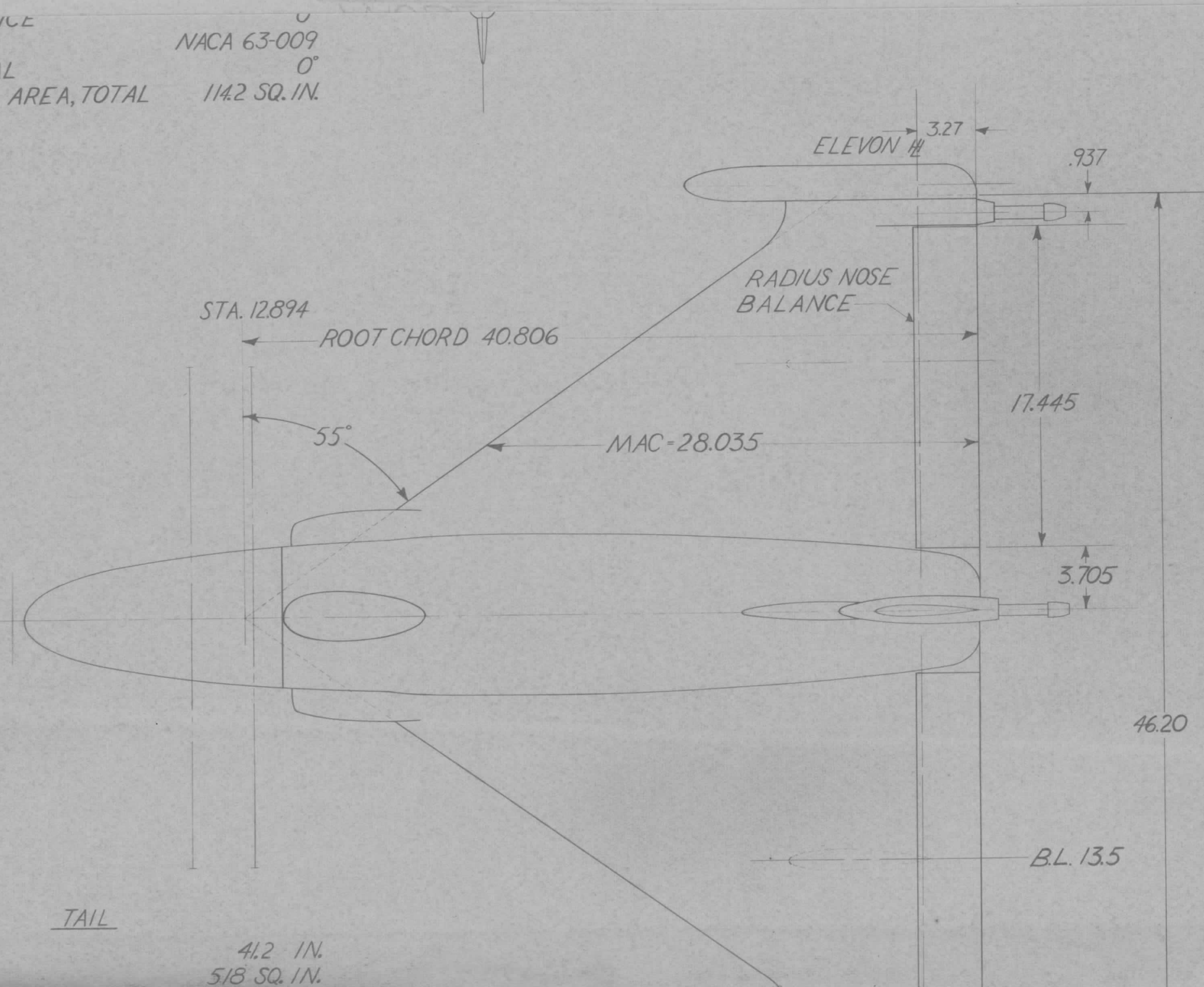


DIMENSIONAL DATA

WING

AREA	1121 SQ. IN.
MAC	28.035 IN.
ASPECT RATIO	1.90

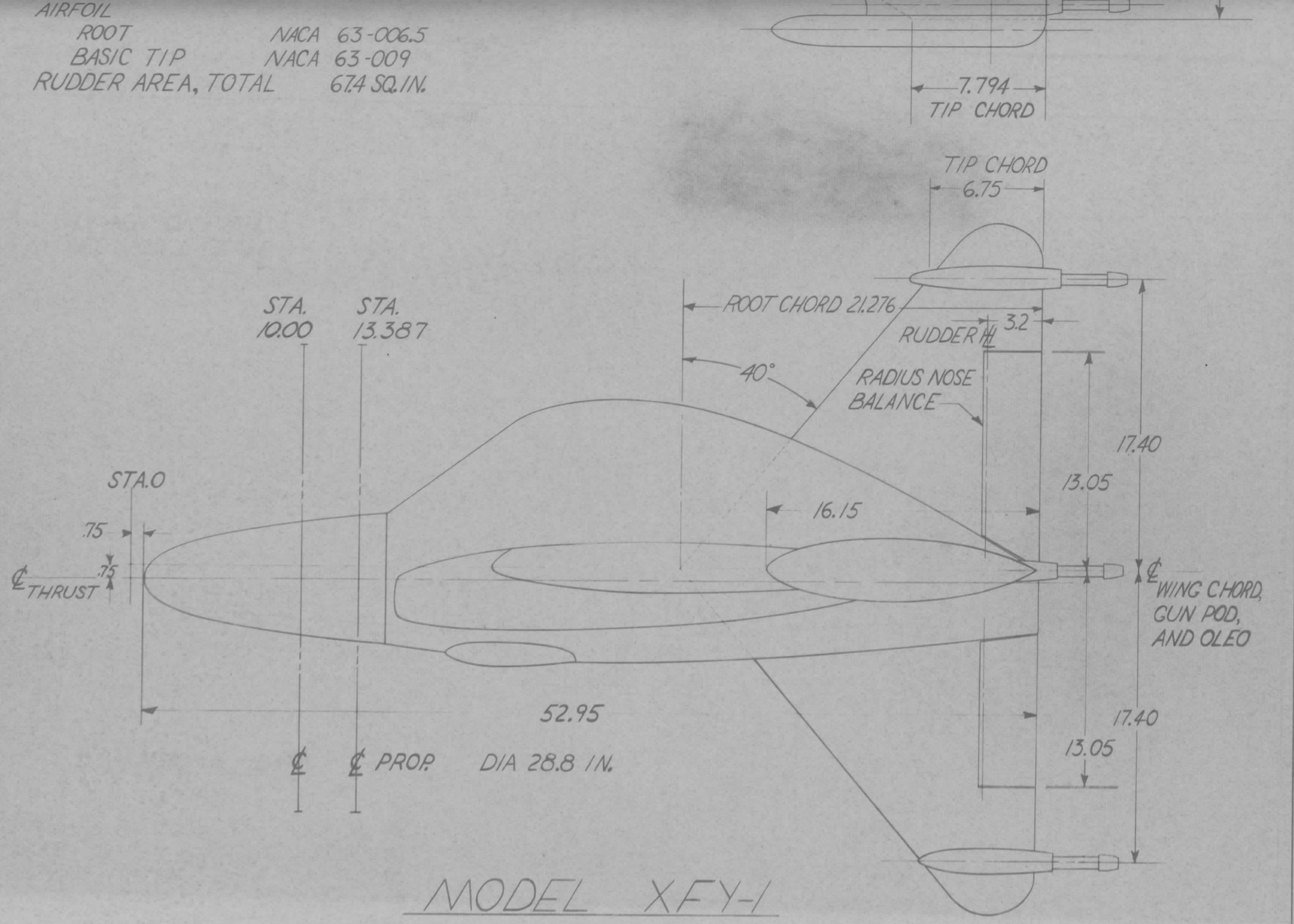
INCIDENCE	0
AIRFOIL	NACA 63-009
DIHEDRAL	0°
ELEVON AREA, TOTAL	114.2 SQ. IN.



TAIL

SPAN	41.2 IN.
AREA	518 SQ. IN.

AIRFOIL
ROOT NACA 63-006.5
BASIC TIP NACA 63-009
RUDDER AREA, TOTAL 67.4 SQ.IN.



MODEL XFY-1
GENERAL ARRANGEMENT

- Report Cnal 96

ALL DIMENSIONS ARE
INCHES MODEL SCALE

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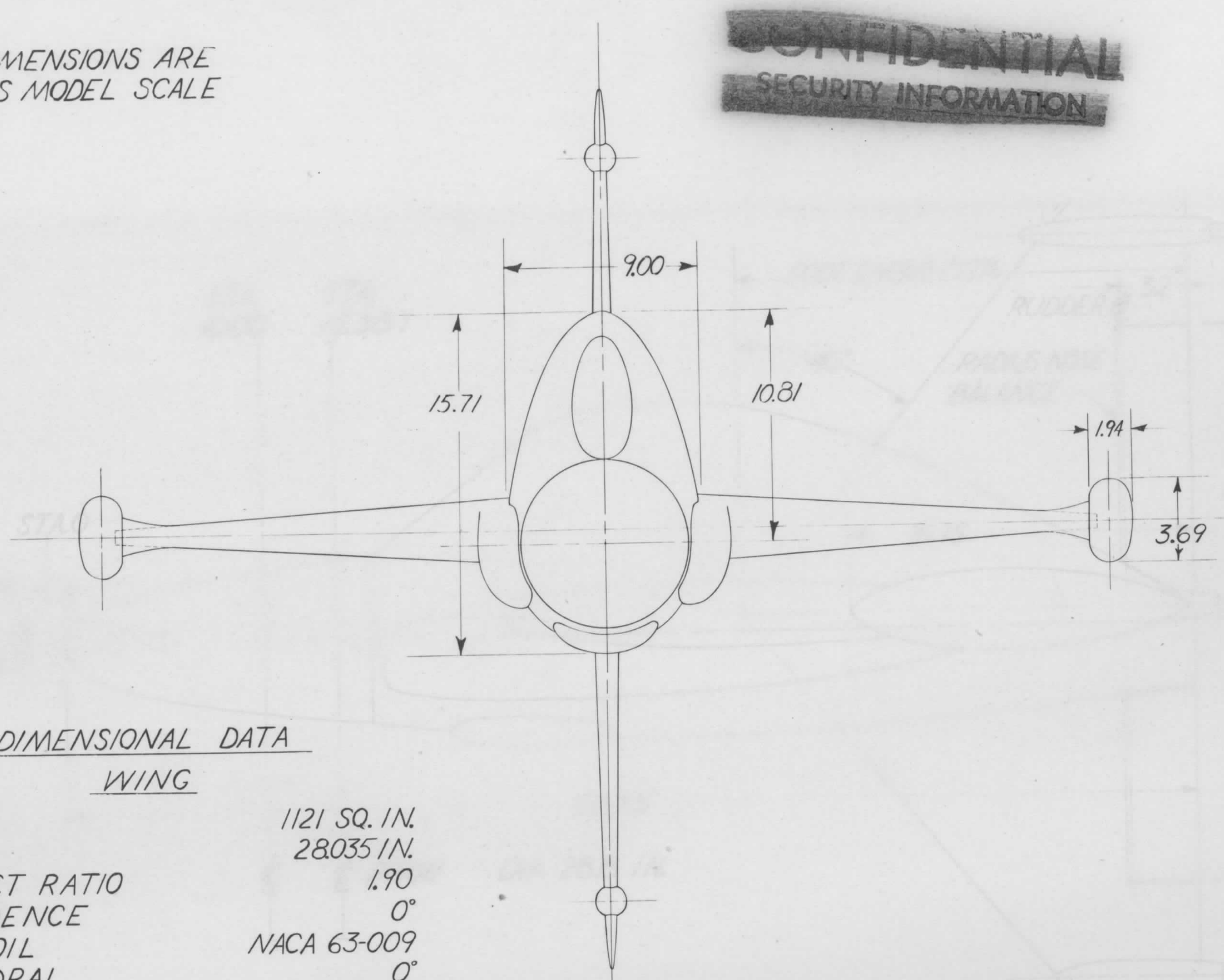
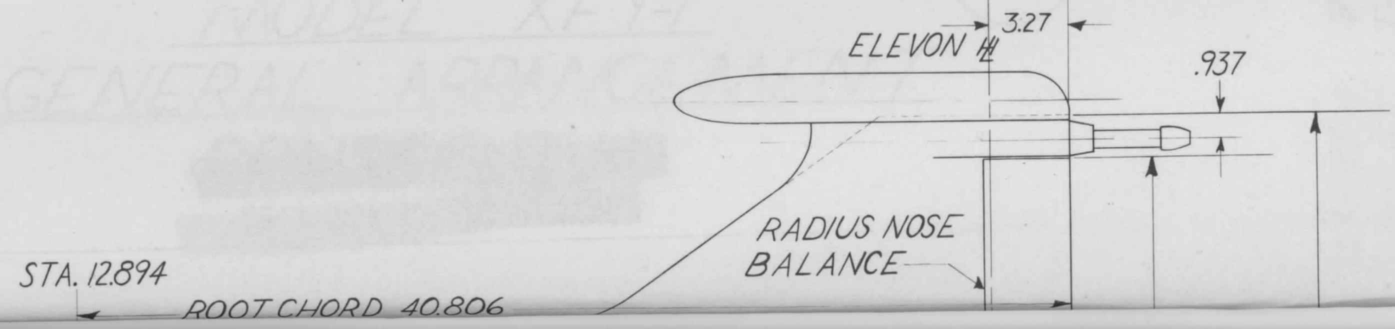
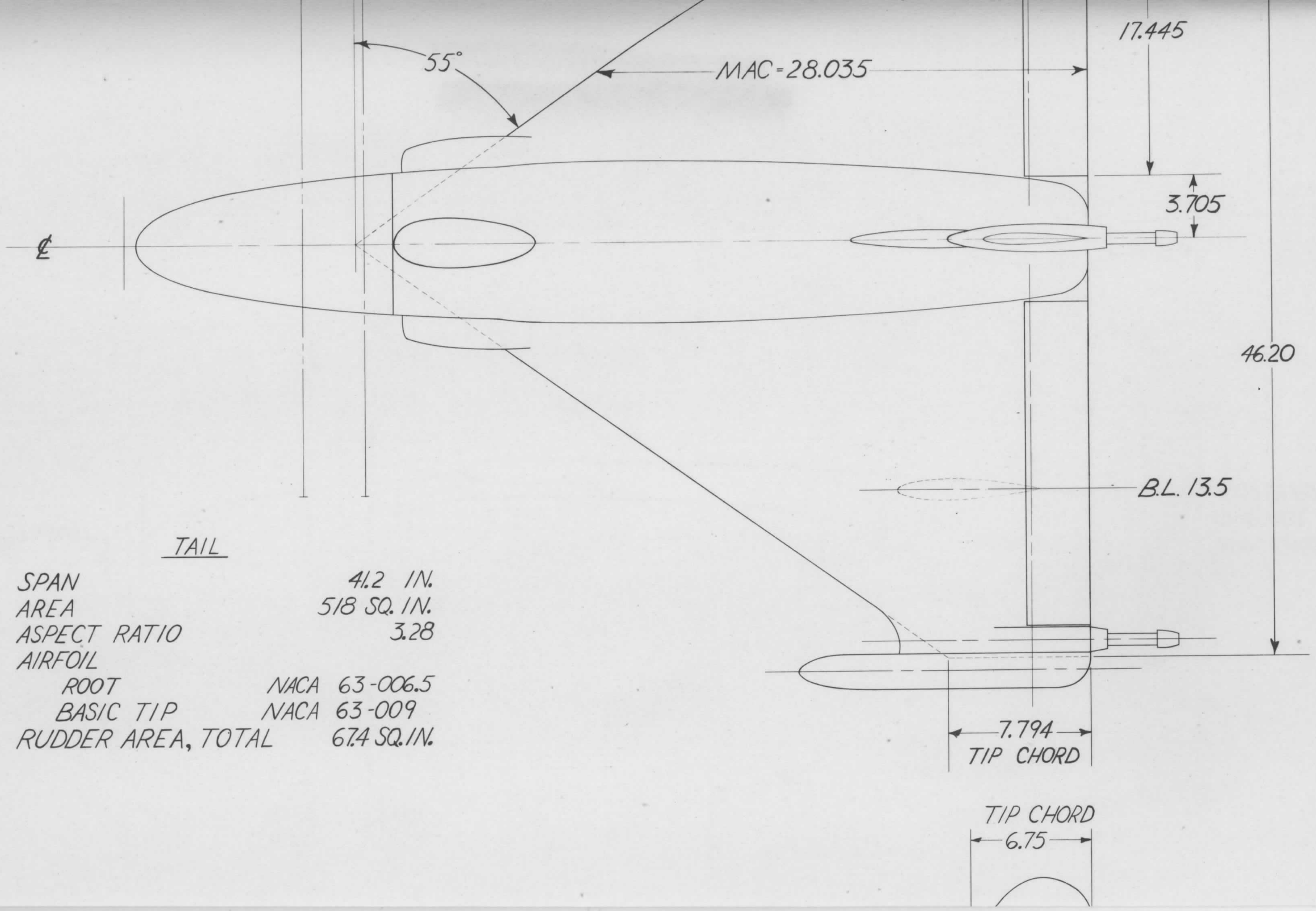


DIMENSIONAL DATA

WING

AREA	1121 SQ. IN.
MAC	28.035 IN.
ASPECT RATIO	1.90
INCIDENCE	0°
AIRFOIL	NACA 63-009
DIHEDRAL	0°
ELEVON AREA, TOTAL	114.2 SQ. IN.





TAIL

SPAN	41.2 IN.
AREA	518 SQ. IN.
ASPECT RATIO	3.28
AIRFOIL	
ROOT	NACA 63-006.5
BASIC TIP	NACA 63-009
RUDDER AREA, TOTAL	67.4 SQ. IN.

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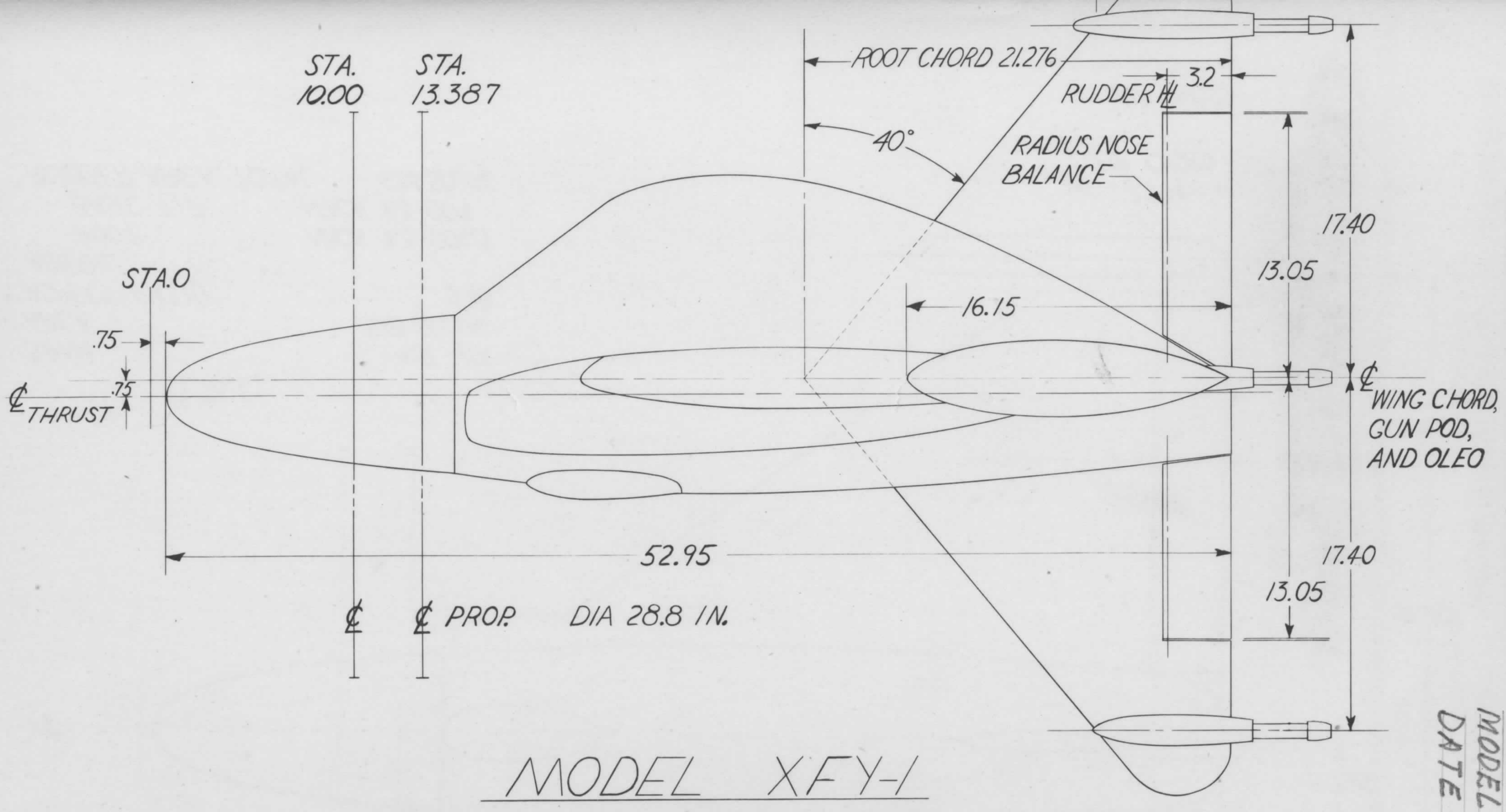

MODEL XFY-1
GENERAL ARRANGEMENT

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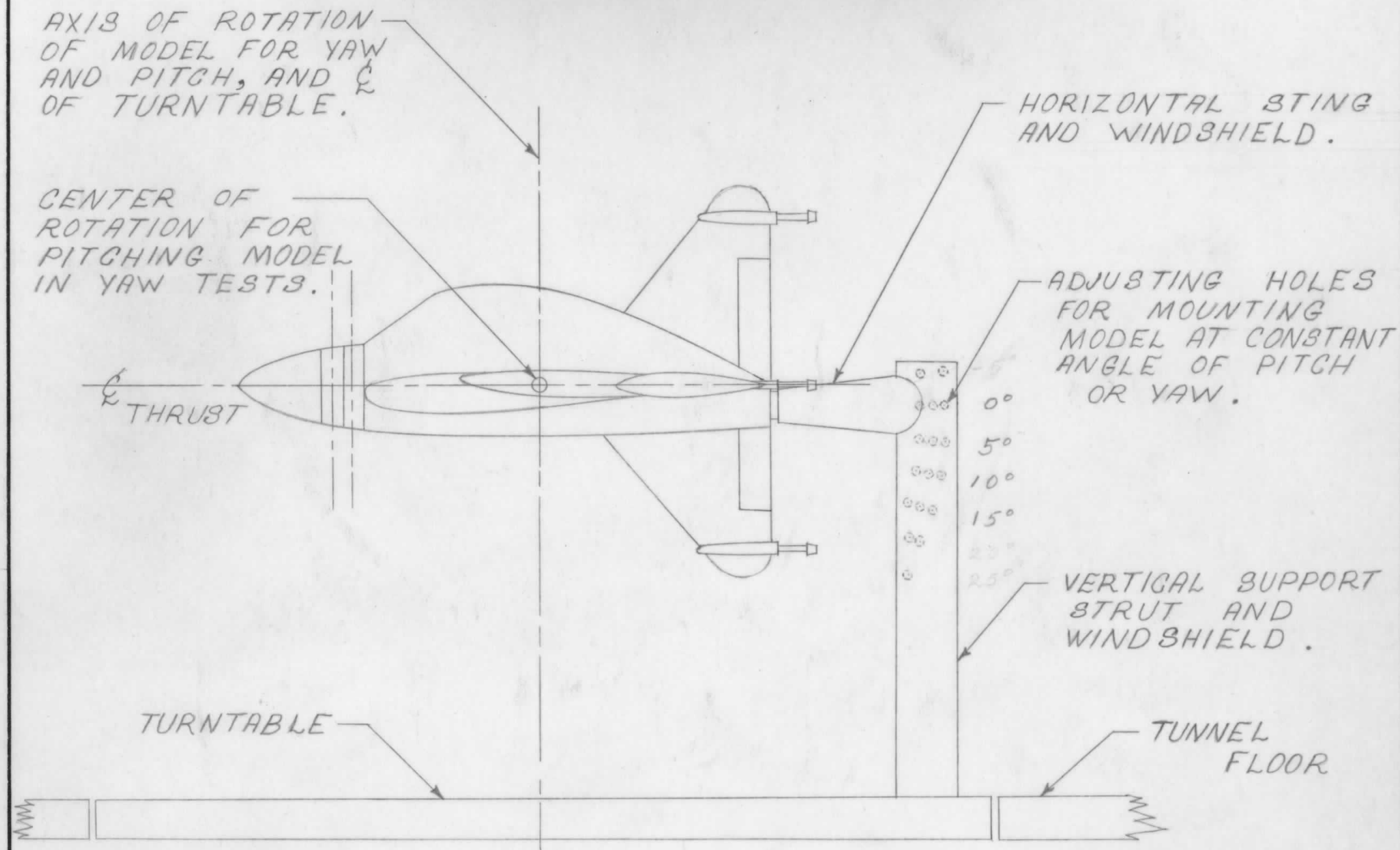
AXIS OF ROTATION OF MODEL FOR YAW AND PITCH, AND ℄ OF TURNTABLE.
HORIZONTAL STING AND WINDSHIELD.
CENTER OF ROTATION FOR PITCHING MODEL IN YAW TESTS.
ADJUSTING HOLES FOR MOUNTING MODEL AT CONSTANT ANGLE OF PITCH OR YAW.
℄ THRUST
-5°
0°
5°
10°
15°
20°
25°
VERTICAL SUPPORT STRUT AND WINDSHIELD.
TURNTABLE
TUNNEL FLOOR

*NOTE: INSTALLATION FOR PITCH TESTS SAME AS YAW TESTS EXCEPT MODEL ROLLED 90° ABOUT ITS LONGITUDINAL AXIS.

MODEL SUPPORT INSTALLATION

FOR YAW TESTS*

.15 SCALE XFY-1

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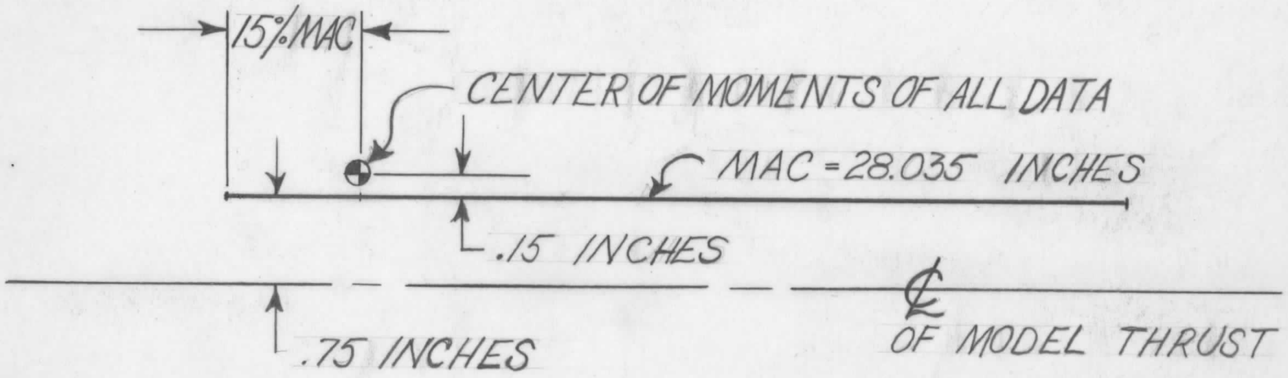
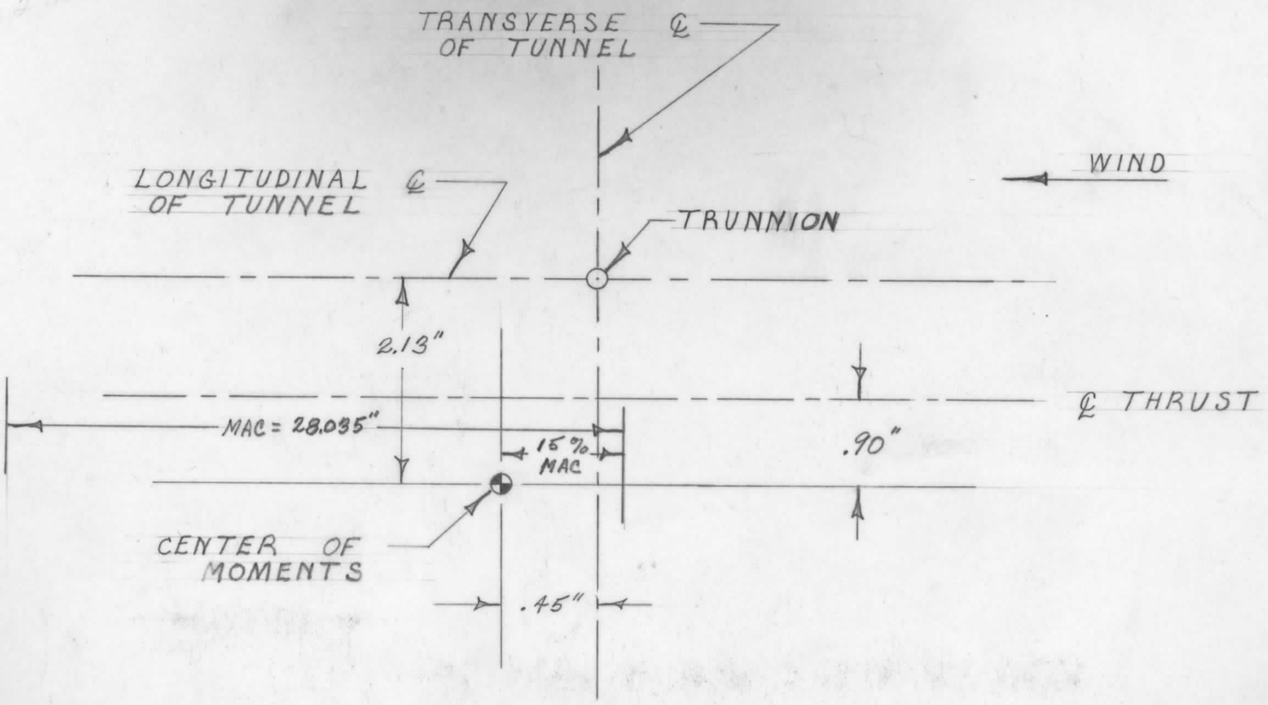
JAN. 21, 1952 C.D.S.



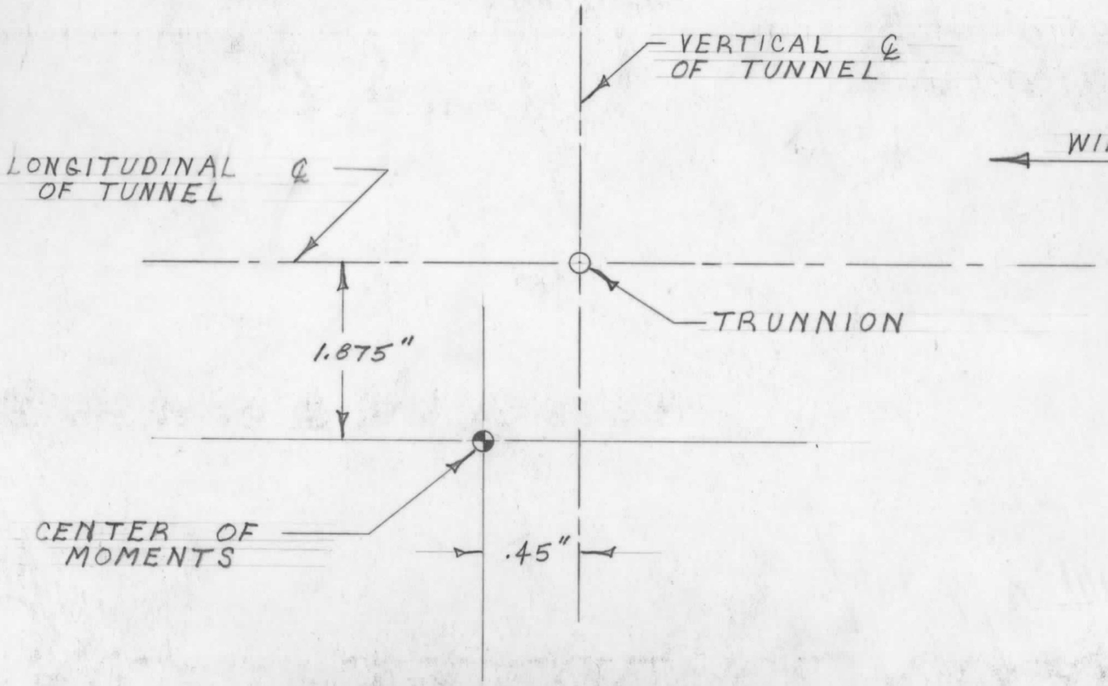
NOTE: DRAWING IS NOT TO SCALE

MOMENT REFERENCE DIAGRAM

MAC = 28.035"



PLAN VIEW OF TUNNEL
SHOWING SIDE VIEW OF MODEL



SIDE VIEW OF TUNNEL
SHOWING PLAN VIEW OF MODEL

MOMENT TRANSFER DIAGRAM

FOR PITCH AT $\psi_0 = 0°$

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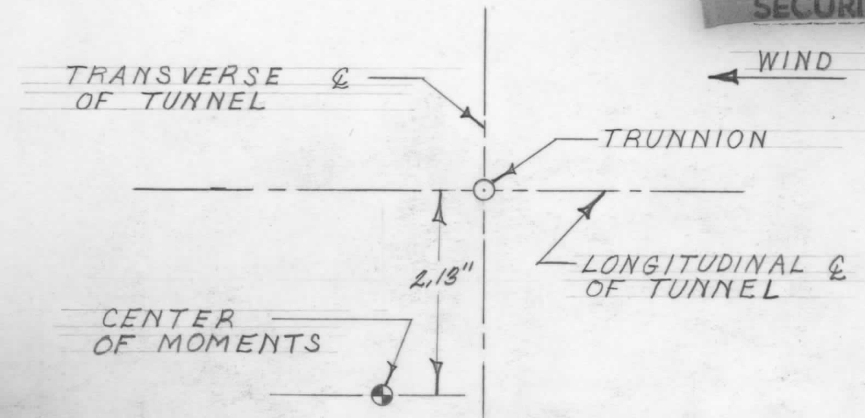
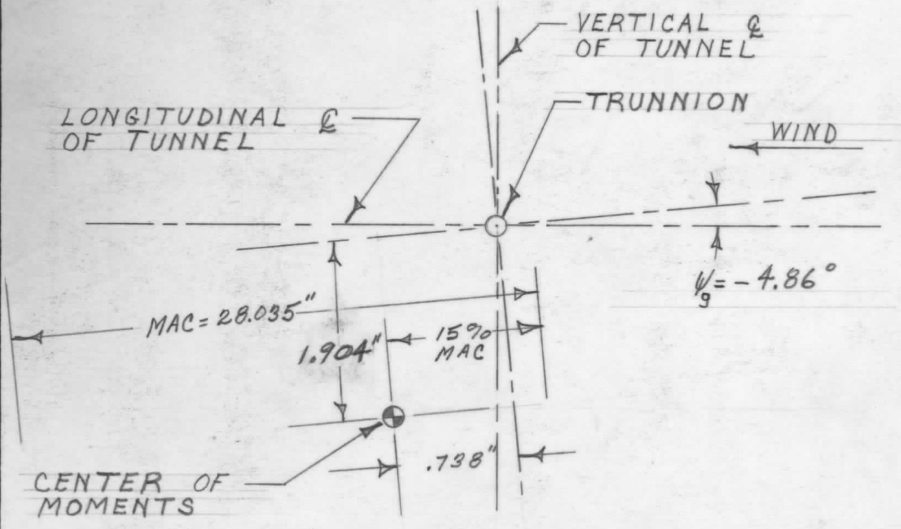


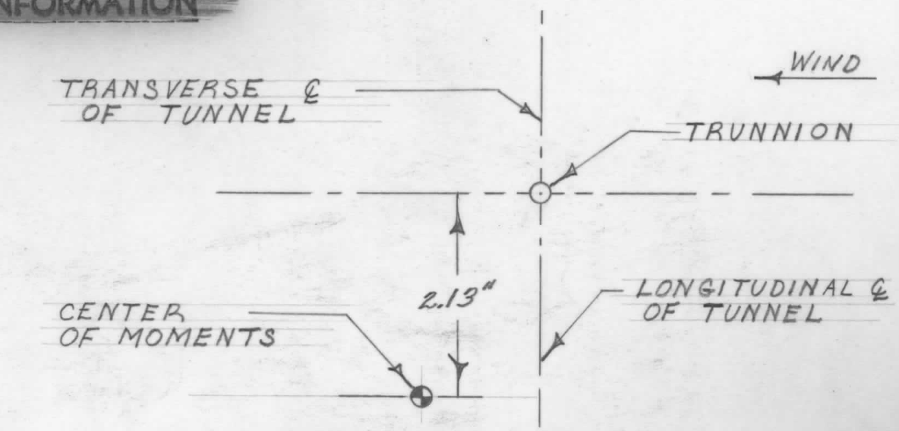
PLAN VIEW OF TUNNEL
SHOWING SIDE VIEW OF MODEL



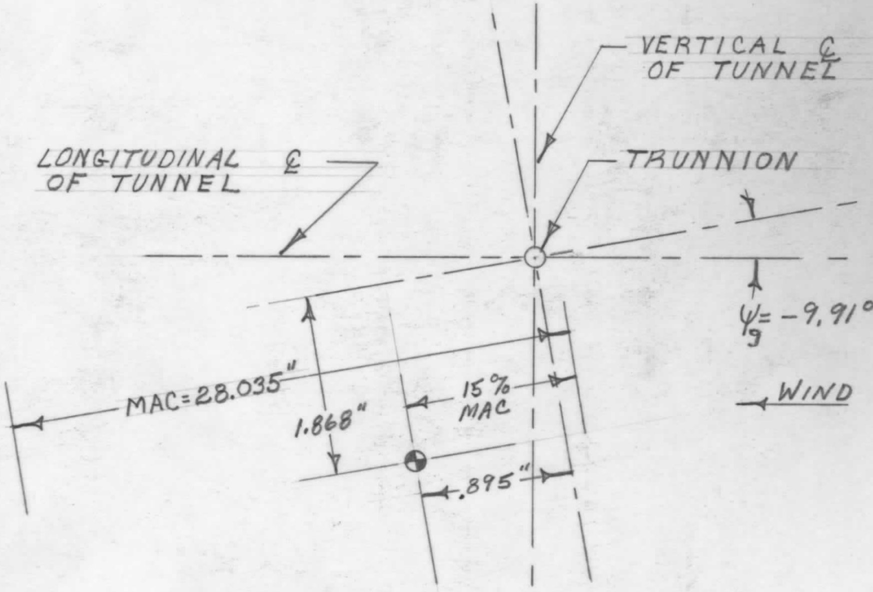
SIDE VIEW OF TUNNEL
SHOWING PLAN VIEW OF MODEL

MOMENT TRANSFER DIAGRAM

FOR PITCH AT $\psi_g = -4.86°$



PLAN VIEW OF TUNNEL
SHOWING SIDE VIEW OF MODEL



SIDE VIEW OF TUNNEL
SHOWING PLAN VIEW OF MODEL

MOMENT TRANSFER DIAGRAM

FOR PITCH AT $\psi_g = -9.91°$

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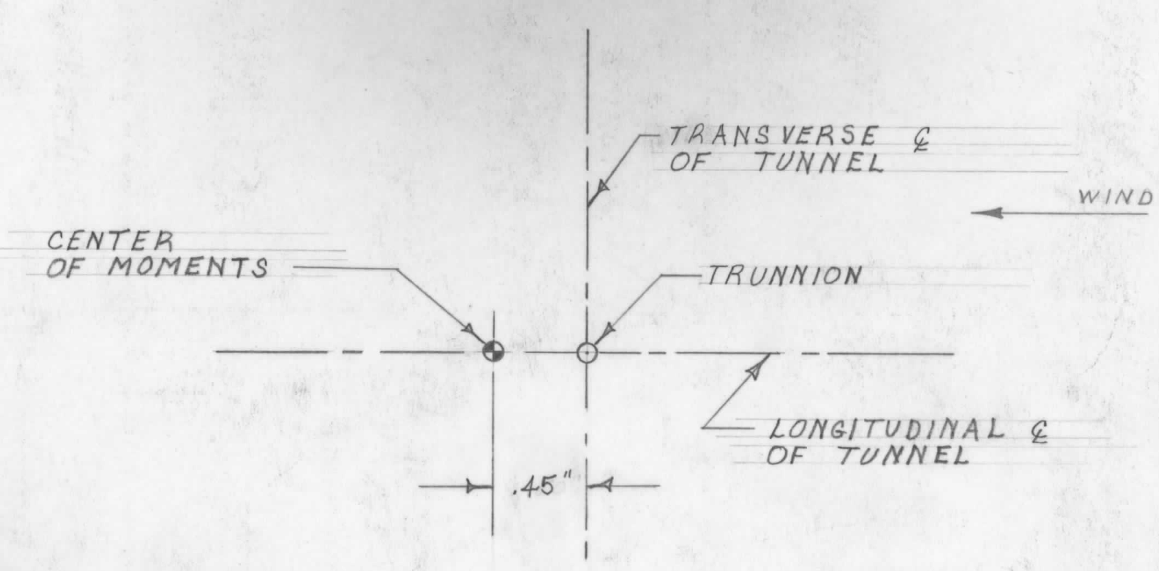
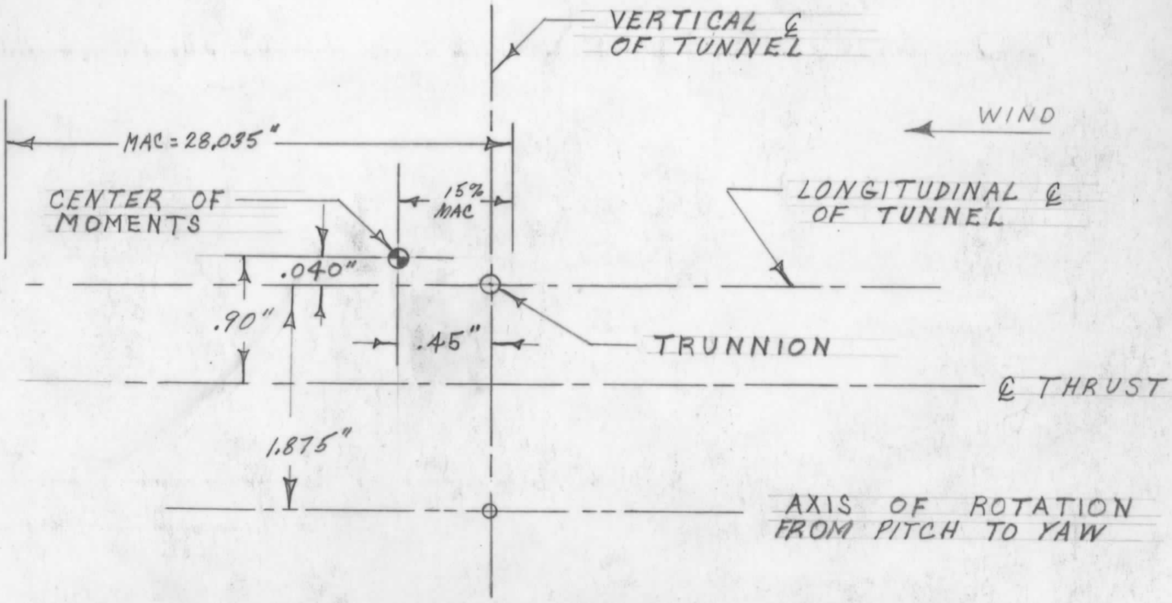


PLAN VIEW OF TUNNEL
SHOWING PLAN VIEW OF MODEL



SIDE VIEW OF TUNNEL
SHOWING SIDE VIEW OF MODEL

MOMENT TRANSFER DIAGRAM

FOR YAW AT $\alpha_g = 0°$

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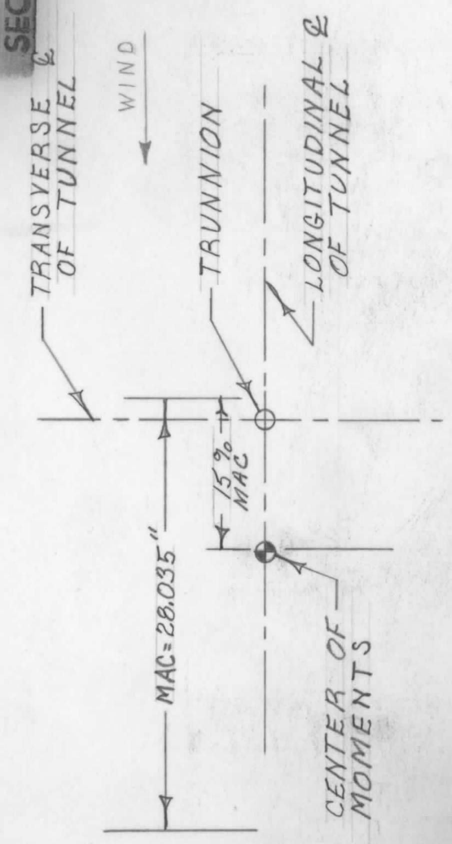
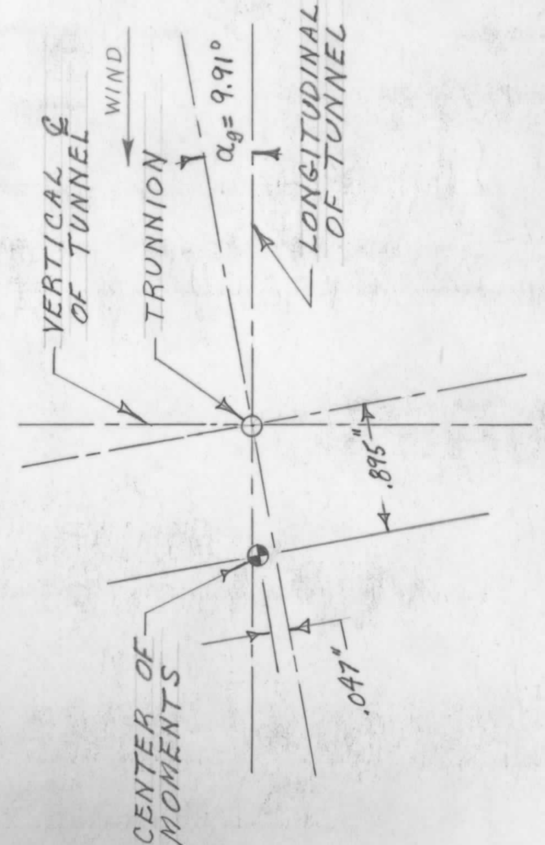
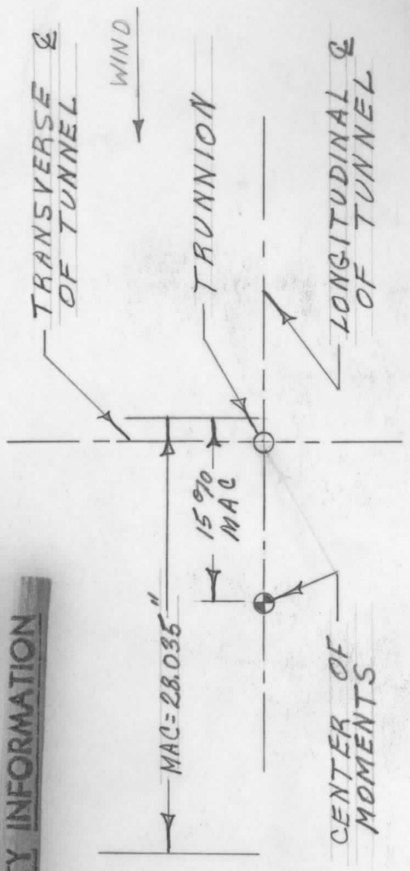


PLAN VIEW OF TUNNEL
SHOWING PLAN VIEW OF MODEL

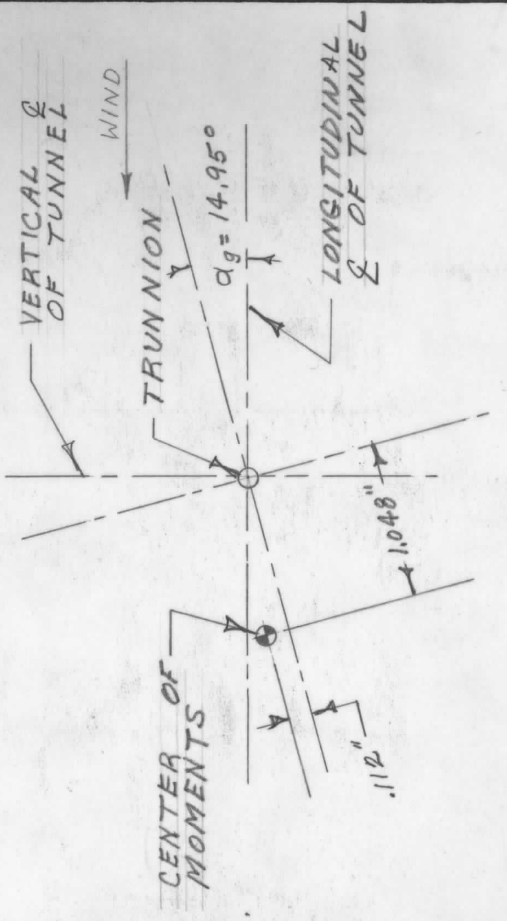


SIDE VIEW OF TUNNEL
SHOWING SIDE VIEW OF MODEL

MOMENT TRANSFER DIAGRAM
FOR YAW AT α_g = 9.91°



PLAN VIEW OF TUNNEL
SHOWING PLAN VIEW OF MODEL



SIDE VIEW OF TUNNEL
SHOWING SIDE VIEW OF MODEL

MOMENT TRANSFER DIAGRAM
FOR YAW AT α_g = 14.95°

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DESCRIPTION OF MODEL COMPONENTS

Symbol	Description	CVAC Dwg. No.
S	Complete model (WBVOMFC)	WT-51-5012
W	Wing	WT-51-5006
B	Body	WT-51-5007
V	Vertical tails	WT-51-5008
O	All 4 oleo struts	WT-51-5013
M	Both machine gun pods	WT-51-5013
F	Aileron actuator fairings	WT-51-5012
C	Oil cooler	WT-51-5012
B_1	Body with open canopy	WT-51-5012
P	Propellers	WT-51-5016 WT-51-5050 WT-51-5010
GB	Ground board at 3.4" below oleo struts (2 ft. full scale)	
	Tape on front of sting windshield	

NOMENCLATURE

Definitions

Y_6	yaw test measuring 6 components
P_6	pitch test measuring 6 components
Prop. Calib.	propeller calibration test
CTP_6	constant thrust pitch test measuring 6 components
CTY_6	constant thrust yaw test measuring 6 components
CRP_6	constant RPM propeller calibration test in pitch
TTP_6	transition thrust pitch test measuring 6 components
Pix	tuft photographs
HP_6	hovering pitch test measuring 6 components
HY_6	hovering yaw test measuring 6 components
Vane Pix	photographs of upwash vane mounted on model - not presented
Stovepipe	upper portion of support windshield used as an image windshield

Coefficients

Stability Axis Notation: (see sketch page 17)

C_L	lift coefficient (lift/qS)
C_D	drag coefficient (drag/qS)
C_c	side force coefficient (side force/qS)
C_m	pitching moment coefficient (pitching moment/qSc)
C_l	rolling moment coefficient, rolling moment/qSb)
C_n	yawing moment coefficient, yawing moment/qSb)

NOMENCLATURE (Cont.)

Coefficients (Cont.)

Body Axis Notation (see sketch page 18)

Transitional Flight Data

C_z	normal force coefficient, positive down (normal force/qS)
C_x	axial force coefficient, positive forward (axial force/qS)
C_y	side force coefficient (side force/qS)
C_m	pitching moment coefficient (pitching moment/qSc)
C_l	rolling moment coefficient (rolling moment/qSb)
C_n	yawing moment coefficient (yawing moment/qSb)

Hovering Flight Data

C_z'	normal force coefficient (normal force/q_{s_∞} S)
C_x'	axial force coefficient (axial force/q_{s_∞} S)
C_y'	side force coefficient (side force/q_{s_∞} S)
C_m'	pitching moment coefficient (pitching moment/$q_{s_\infty} S_c$)
C_l'	rolling moment coefficient (rolling moment/q_{s_∞} Sb)
C_n'	yawing moment coefficient (yawing moment/q_{s_∞} Sb)

Subscript $.15\bar{c}$ shows horizontal location of moment reference. Vertical reference shown on page 7.

α_g, θ_g	geometric angle of attack of the wing reference plane relative to tunnel axis
α_t	geometric angle of attack-setting of tunnel balance system
α	angle of attack of the wing reference plane relative to equivalent free stream
ψ_g	geometric angle of yaw of the model plane of symmetry relative to tunnel axis
Tc'	thrust coefficient (thrust/qS)

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NOMENCLATURE (Cont.)

Symbols	
δ_e	elevon angle when deflected as an elevator, referred to wing chord plane (+ down, - up)
δ_r	rudder angle referred to chord plane of vertical tail (+ left, - right)
δ_a	elevon angle when deflected as an aileron referred to wing chord plane. (+ down, - up), sign of right elevon is given above the sign of the left.
q_m	uncorrected dynamic pressure
q	dynamic pressure averaged over model span, ($1/2 \rho V^2$)
V	average airstream velocity, ft/sec
ρ	mass density of air, corrected for compressibility, (slugs/cu.ft)
q_{s_∞}	dynamic pressure of propeller slipstream ($\frac{4T}{\pi D^2}$)
$\frac{V_z}{V_{s_\infty}}$	crosswind velocity ratio for hovering
$\frac{V_y}{V_{s_\infty}}$	crosswind velocity ratio for hovering
V_z	crosswind toward lower wing surface tending to increase angle of attack
V_y	crosswind normal to left side of vertical tail tending to increase angle of yaw
V_{s_∞}	velocity of propeller slipstream
T	model thrust, lbs.
D	model propeller diameter, ft.
RPM	model propeller revolutions/min.
β	propeller blade angle at .75 Radius degrees

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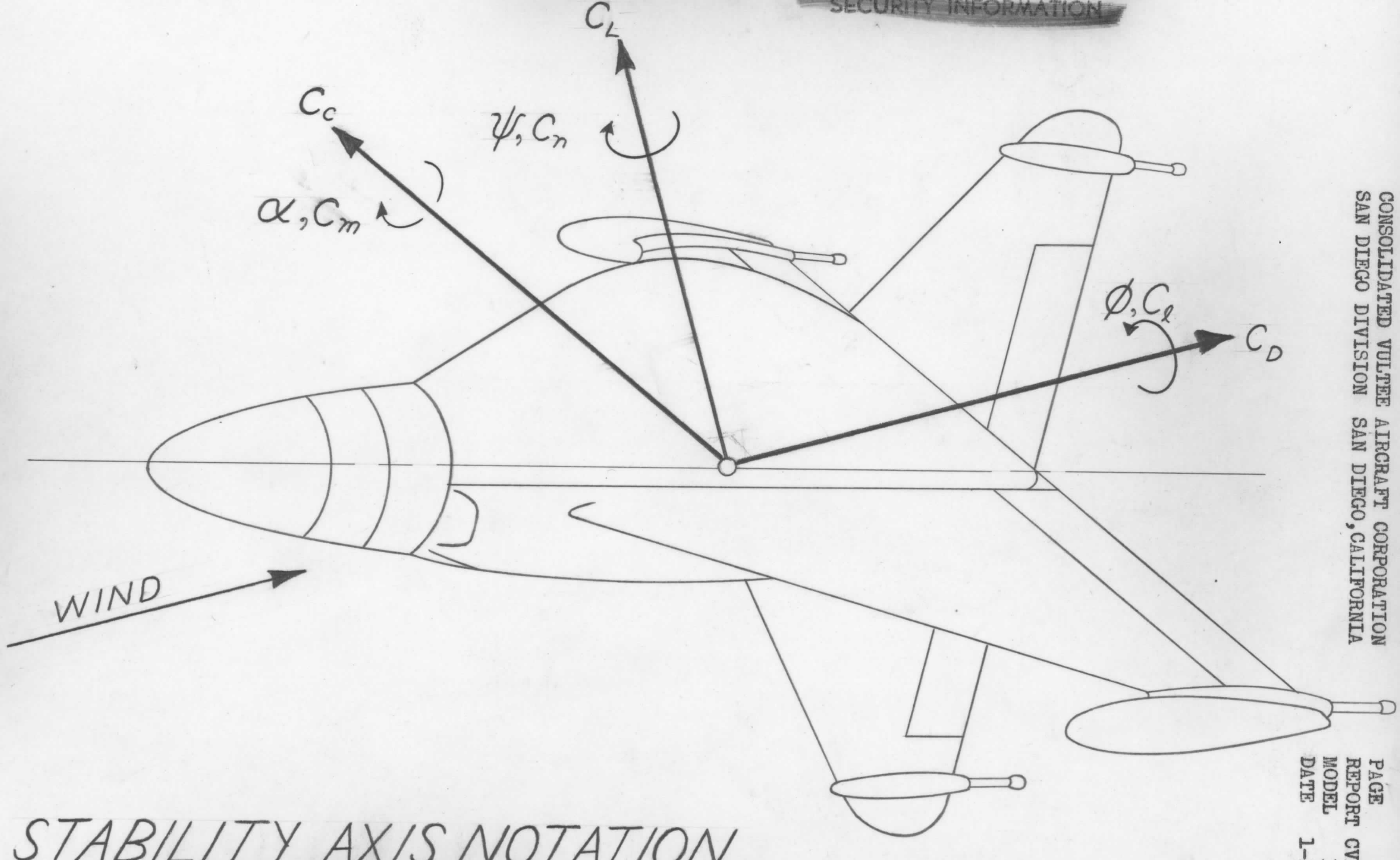
NOMENCLATURE (Cont.)

Symbols (Cont.)

$\bar{c}$	model mean aerodynamic chord, ft.
b	model wing span, ft.
S	model wing area, sq.ft.



STABILITY AXIS NOTATION

POSITIVE DIRECTION OF FORCES,
MOMENTS, AND ANGLES ARE SHOWN

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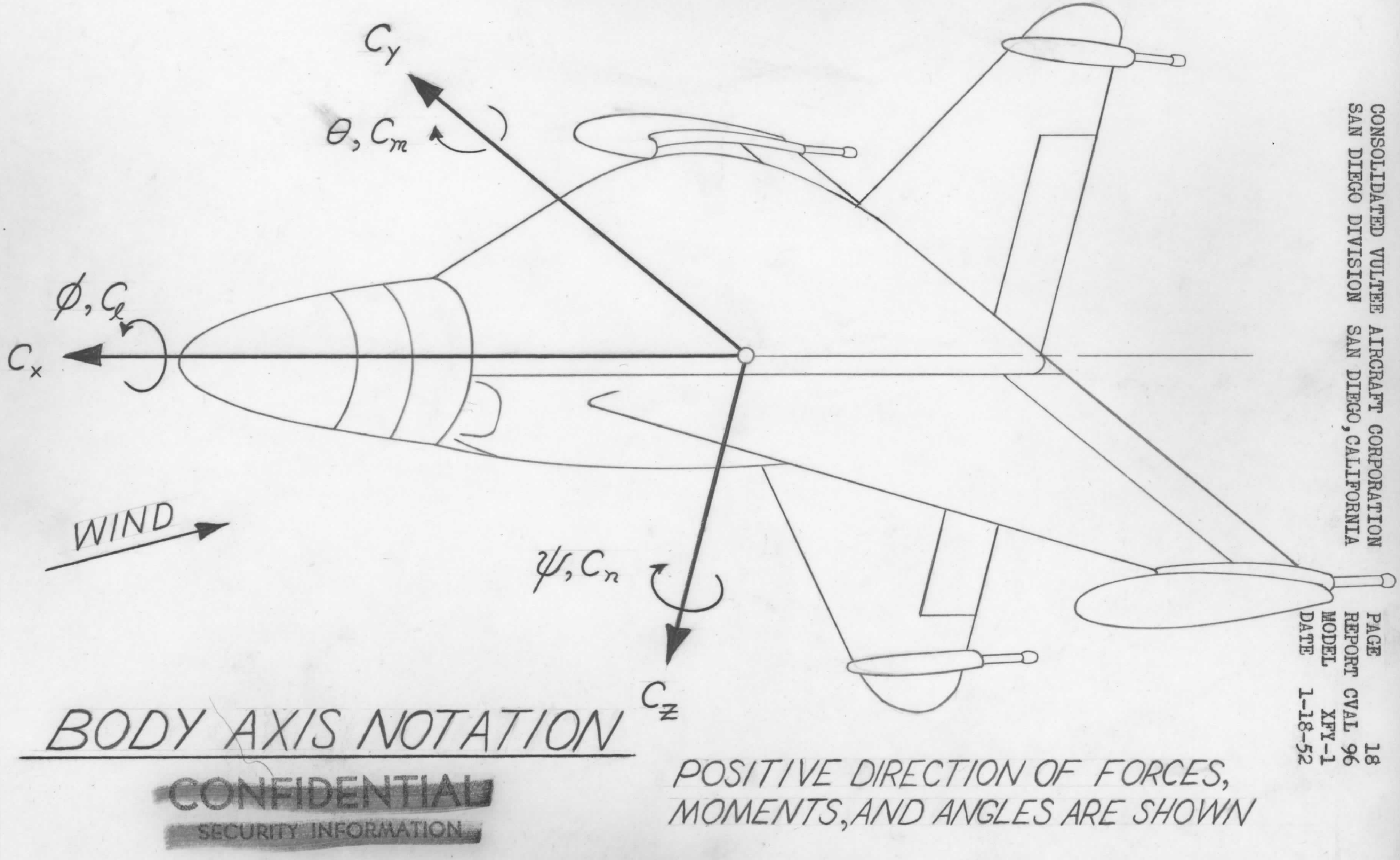

BODY AXIS NOTATION

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POSITIVE DIRECTION OF FORCES,
MOMENTS, AND ANGLES ARE SHOWN

RUN INDEX

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MODEL CONDITION	Good	PREVIOUS TESTS	
BAYONETS	Special	WINDSHIELDS	Special
TRUNNION SPACING	----	BOOM TAIL LENGTH	---

S = WB VOMFC - Level Flight Configuration, Canopy Closed

WB_1VOMFC - Transition and Hovering Configuration, Canopy Open

DATE 1951	RUN	CONFIGURATION	TEST	q_m	α_g °	ψ_g °	δ_a °	δ_e °	δ_r °	β °	T_c'	
10-4	1	S	Y_6	25	0°	-2 to 28	0°	0°	0°	-	-	
"	1a	"	"	"	"	"	"	"	"	-	-	Bad zero return on Run 1
"	2	"	P_6	"	-2 to 28	0	"	"	"	-	-	
"	2a	"	"	"	"	"	"	"	"	-	-	Bad zero return on Run 2
"	3	" + Vane	Vane Pix	"	"	"	"	"	"	-	-	Upwash vane forward of wing. No force data taken on Runs 3 & 4
"	4	" + "	"	40	"	"	"	"	"	-	-	
"	5	" + "	P_6	"	-2 to 12	"	"	"	"	-	-	
"	6	"	"	10	-2 to 28	"	"	"	"	-	-	
"	7	"	"	25	"	"	"	-5	"	-	-	
10-19	8	"	Y_6	15	0	-2 to 28	"	0	"	-	-	
"	9	"	P_6	"	-2 to 28	0	"	"	"	-	-	
"	10	S + P	Prop.* Calib.	"	0	"	"	"	"	30	Var.	RPM= 2000 To 4000 by 200
"	10A	"	"	"	"	"	"	"	"	"	"	" "

*Runs 10,10A,and 11; The propeller was calibrated against a thrust strain gage which did not yield satisfactory results

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FORM 6-556a

RUN INDEX

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DATE 1951	RUN	CONFIGURATION	TEST	q_m	α_g °	ψ_g °	δ_a°	δ_e°	δ_r°	β °	T_c'	
10-19	11	S + P	Prop. Calib. *	15	0	0	0	0	0	25	0	RPM = 2000 to 4000 by 200
"	12	"	CTP$_6$	"	-2 to 28	"	"	"	"	50	"	* See note on page 19
"	13	"	"	"	"	"	"	"	"	40	"	
"	14	"	"	"	"	"	"	"	"	"	0.4	
"	15	"	"	"	"	"	"	"	"	20	0	
10-22	16	"	"	"	"	"	"	"	"	"	0.4	
"	16A	"	"	"	"	"	"	"	"	"	"	Bad zero Return on Run 16
"	17	"	"	"	"	"	"	"	"	25	0	
"	18	"	"	"	"	"	"	"	"	"	0.2	
"	19	"	"	"	"	"	"	"	"	"	0.4	
"	20	"	"	"	-2 to 8	"	"	"	"	"	0.8	
"	21	"	"	"	-2 to 28	"	"	-5	"	"	0	
"	22	"	"	"	"	"	"	"	"	"	0.2	
"	23	"	"	"	"	"	"	"	"	"	0.4	
"	24	"	"	"	-2 to 20	"	"	"	"	"	0.8	
"	25	"	"	"	-2 to 28	"	"	-10	"	"	0	
"	26	"	"	"	"	"	"	"	"	"	0.2	
"	27	"	"	"	"	"	"	"	"	"	0.4	
"	28	"	"	"	-2 to 20	"	"	"	"	"	0.8	
"	29	"	"	"	-2 to 28	"	"	-20	"	"	0	

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DATE 1951	RUN	CONFIGURATION	TEST	q_m	α_g °	ψ_g °	δ_a °	δ_e °	δ_r °	β °	T_c'	
10-22	30	S + P	CTP_6	15	-2 to 28	0	0	-20	0	25	0.2	Drag prints 20# for 24#
"	30A	"	"	"	"	"	"	"	"	"	"	
"	31	"	"	"	"	"	"	"	"	"	0.4	
"	32	"	"	"	-2 to 20	"	"	"	"	"	0.8	
"	33	"	CTY_6	"	0	-2 to 28	"	0	"	"	0	
"	34	"	"	"	"	"	"	"	"	"	0.2	
"	35	"	"	"	"	"	"	"	"	"	0.4	
"	36	"	"	"	"	-2 to 20	"	"	"	"	0.8	
"	37	"	"	"	"	-2 to 28	"	"	-10	"	0	
"	38	"	"	"	"	"	"	"	"	"	0.2	
"	39	"	"	"	"	"	"	"	"	"	0.4	
"	40	"	"	"	"	-2 to 20	"	"	"	"	0.8	
"	41	"	CTP_6	"	-2 to 28	0	"	"	"	"	0	
"	42	"	"	"	"	"	"	"	"	"	0.2	
"	43	"	"	"	"	"	"	"	"	"	0.4	
"	44	"	"	"	"	"	"	"	"	"	0.8	
"	45	B	P_6	"	0 to100	"	-	-	-	-	-	
"	46	"	"	11	"	"	-	-	-	-	-	
"	47	"	"	5	"	"	-	-	-	-	-	
"	48	"	"	2	"	"	-	-	-	-	-	

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10-22	49	B + P	CRP_6	15	0 to 100	0	-	-	-	15	-	4000	
10-23	49A	"	"	"	"	"	-	-	-	"	-	4000	Interference between props on Run 49
"	50	"	"	"	"	"	-	-	-	"	-	4500	
"	51	"	"	"	"	"	-	-	-	"	-	5000	
"	52	"	"	"	"	"	-	-	-	"	-	5500	
"	53	"	"	11	"	"	-	-	-	"	-	4000	
"	54	"	"	"	"	"	-	-	-	"	-	4500	
"	55	"	"	"	"	"	-	-	-	"	-	5000	
"	56	"	"	"	"	"	-	-	-	"	-	5500	
"	57	"	"	"	"	"	-	-	-	"	-	6000	
"	58	"	"	"	"	"	-	-	-	"	-	6840	
"	59	"	"	5	"	"	-	-	-	"	-	4000	
"	60	"	"	"	"	"	-	-	-	"	-	4500	
"	61	"	"	"	"	"	-	-	-	"	-	5000	
"	62	"	"	"	"	"	-	-	-	"	-	5500	
"	63	"	"	"	"	"	-	-	-	"	-	6000	
"	64	"	"	"	"	"	-	-	-	"	-	6500	
"	65	"	"	2	"	"	-	-	-	"	-	4000	
"	66	"	"	"	"	"	-	-	-	"	-	4500	
"	67	"	"	"	"	"	-	-	-	"	-	5500	

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10-23	68	B + P	CRP$_6$	2	0 to 50	0	-	-	-	15	-	5500
"	69	WB$_1$VOMFC + P	TTP$_6$	12	0 to 100	"	0	0	0	"	1.2	
"	70	" WB$_1$VOMFC + P + Tufts	" TTP$_6$ +Pix	5	"	"	"	"	"	"	4.0	
"	71	WB$_1$VOMFC + P + Tufts	TTP$_6$ +Pix	12	"	"	"	"	"	"	1.2	
"	72	"	"	5	"	"	"	"	"	"	4.0	
"	73	"	"	15	"	"	"	"	"	"	0.8	
10-24	74	"	"	8	"	"	"	"	"	"	2.0	
"	75	"	"	2	"	"	"	"	"	"	7.0	
"	76	"	"	15	"	"	"	-10	"	"	0.8	
"	77	"	"	12	"	"	"	"	"	"	1.2	
"	78	"	"	8	"	"	"	"	"	"	2.0	
"	79	"	"	5	"	"	"	"	"	"	4.0	
"	80	"	"	2	"	"	"	"	"	"	7.0	
"	81	"	"	15	"	"	"	-20	"	"	0.8	
10-25	82	"	"	12	"	"	"	"	"	"	1.2	
"	83	"	"	8	"	"	"	"	"	"	2.0	
"	84	"	"	5	"	"	"	"	"	"	4.0	
"	85	"	"	2	"	"	"	"	"	"	7.0	
"	86	"	"	15	"	"	"	10	"	"	0.8	
"	87	"	TTP$_6$	12	"	"	"	"	"	"	1.2	

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10-25	88	WB_1VOMFC + P + Tufts	TTP_6	8	0 to 100	0	0	10	0	15	2.0
"	89	"	"	5	"	"	"	"	"	"	4.0
"	90	"	TTP_6 + pix	2	"	"	"	"	"	"	7.0
"	91	"	"	15	"	"	R+10 L-10	0	"	"	0.8
"	92	"	TTP_6	8	"	"	"	"	"	"	2.0
"	93	"	TTP_6 + pix	2	"	"	"	"	"	"	7.0
"	94	"	TTP_6 + Stove pipe	12	"	"	0	"	"	"	1.2
"	95	S + P + Tufts	"	15	-2 to 28	"	"	"	"	25	0.4
"	96	"	CTP_6	"	"	"	"	"	"	"	"
"	97	WB_1VOMFC + P + Tufts	TTP_6 + pix	"	0 to 100	"	R+10 L-10	-10	"	15	0.8
"	98	"	TTP_6	8	"	"	"	"	"	"	2.0
"	99	"	TTP_6 + pix	2	"	"	"	"	"	"	7.0
"	100	"	"	15	"	"	"	10	"	"	0.8
"	101	"	TTP_6	8	"	"	"	"	"	"	2.0
"	102	"	TTP_6 + pix	2	"	"	"	"	"	"	7.0
"	103	"	TTP_6	15	"	"	0	0	10	"	0.8
"	104	"	"	12	"	"	"	"	"	"	1.2
"	105	"	"	8	"	"	"	"	"	"	2.0
"	106	"	"	5	"	"	"	"	"	"	4.0
"	107	"	"	2	"	"	"	"	"	"	7.0

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10-26	108	$WB_1VOMFC + P +$ Tufts	$TTP_6 + pix$	15	0 to 100	-9.9	0	0	10	15	0.8	
"	108A	"	TTP_6	"	"	"	"	"	"	"	"	Bad zero return on Run 108
"	109	"	"	12	"	"	"	"	"	"	1.2	
"	110	"	"	8	"	"	"	"	"	"	2.0	
"	111	"	"	5	"	"	"	"	"	"	4.0	
"	112	"	$TTP_6 + pix$	2	"	"	"	"	"	"	7.0	
"	113	"	"	15	"	"	"	"	0	"	0.8	
"	114	"	TTP_6	12	"	"	"	"	"	"	1.2	
"	115	"	"	8	"	"	"	"	"	"	2.0	
"	116	"	"	5	"	"	"	"	"	"	4.0	Face of sting windshield improperly taped on Runs 108-126
"	117	"	$TTP_6 + pix$	2	"	"	"	"	"	"	7.0	
"	118	$WB_1VOMFC + P$	TTP_6	8	"	"	"	"	"	"	2.0	
"	119	S + P	CTP_6	15	-2 to 28	"	"	"	"	25	0	
"	120	"	"	"	"	"	"	"	"	"	0.2	
"	121	"	"	"	"	"	"	"	"	"	0.4	
"	122	"	"	"	"	"	"	"	"	"	0.8	
"	123	"	"	"	"	"	"	"	10	"	0	
"	124	"	"	"	"	"	"	"	"	"	0.2	
"	125	"	"	"	"	"	"	"	"	"	0.4	
"	126	"	"	"	"	"	"	"	"	"	0.8	

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DATE 1951	RUN	CONFIGURATION	TEST	q_m	α_g°	ψ_g°	δ_a°	δ_e°	δ_r°	β°	T_c'	
10-26	127	S + P	CTY_6	15	9.9	-2 to 28	0	0	0	25	0	
"	128	"	"	"	"	"	"	"	"	"	0.2	
"	129	"	"	"	"	"	"	"	"	"	0.4	
"	130	"	"	"	"	"	"	"	"	"	0.8	
"	131	"	"	"	"	"	"	"	-10	"	0	
"	132	"	"	"	"	"	"	"	"	"	0.2	
"	132A	"	"	"	"	"	"	"	"	"	"	RPM 600 slow on Run 132
"	133	"	"	"	"	"	"	"	"	"	0.4	
"	134	"	"	"	"	"	"	"	"	"	0.8	
"	135	"	CTP_6	"	-2 to 28	-9.9	"	"	0	"	"	
"	122A	"	"	"	"	"	"	"	"	"	"	Check on Run 122 no tape on windshield
"	136	"	CTY_6	"	15	-2 to 28	"	"	"	"	0	
"	137	"	"	"	"	"	"	"	"	"	0.2	
"	138	"	"	"	"	"	"	"	"	"	0.4	
"	139	"	"	"	"	"	"	"	"	"	0.8	
"	140	"	"	"	"	"	"	"	-10	"	0	
10-29	141	"	"	"	"	"	"	"	"	"	0.2	
"	142	"	"	"	"	"	"	"	"	"	0.4	
"	143	"	"	"	"	"	"	"	"	"	0.8	
"	144	WB_1VOMFC + P	TTP_6	"	0 to 100	-4.9	"	"	0	15	0.8	

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DATE 1951	RUN	CONFIGURATION	TEST	q_m	α_g °	ψ_g °	δ_a°	δ_e°	δ_r°	β°	T_c'	
10-29	145	$WB_1VOMFC + P$	TTP_6	12	0 to 100	-4.9	0	0	0	15	1.2	
"	146	"	"	8	"	"	"	"	"	"	2.0	
10-30	147	"	"	5	"	"	"	"	"	"	4.0	
"	148	"	"	2	"	"	"	"	"	"	7.0	
"	149	"	"	15	"	"	"	"	10	"	0.8	
"	150	"	"	12	"	"	"	"	"	"	1.2	
"	151	"	"	8	"	"	"	"	"	"	2.0	
"	152	"	"	5	"	"	"	"	"	"	4.0	
"	153	"	"	2	"	"	"	"	"	"	7.0	
"	108B	"	"	15	"	-9.9	"	"	"	"	0.8	Sting windshield improperly taped on Runs 108,108A
"	108C	"	"	"	"	"	"	"	"	"	"	Bad zero return on Run 108B
"	109A	"	"	12	"	"	"	"	"	"	1.2	Sting wingshield improperly taped on Runs 109-117
"	110A	"	"	8	"	"	"	"	"	"	2.0	
"	111A	"	"	5	"	"	"	"	"	"	4.0	
"	112A	"	"	2	"	"	"	"	"	"	7.0	
"	113A	"	"	15	"	"	"	"	0	"	0.8	
"	114A	"	"	12	"	"	"	"	"	"	1.2	
"	115A	"	"	8	"	"	"	"	"	"	2.0	
"	116A	"	"	5	"	"	"	"	"	"	4.0	
"	117A	"	"	2	"	"	"	"	"	"	7.0	

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DATE 1951	RUN	CONFIGURATION	TEST	q_m	α_g°	ψ_g°	δ_a°	δ_e°	δ_r°	β°	T_c'	
10-30	119A	S + P	CTP_6	15	-2 to 28	-9.9	0	0	0	25	0	Sting windshield improperly taped on Runs 119-121, 122, 122A, 123-126
"	120A	"	"	"	"	"	"	"	"	"	0.2	
"	121A	"	"	"	"	"	"	"	"	"	0.4	
"	122B	"	"	"	"	"	"	"	"	"	0.8	
"	123A	"	"	"	"	"	"	"	10	"	0	
"	124A	"	"	"	"	"	"	"	"	"	0.2	
"	125A	"	"	"	"	"	"	"	"	"	0.4	
"	126A	"	"	"	"	"	"	"	"	"	0.8	
"	154	"	"	"	"	0	"	"	"	"	0	
"	155	"	"	"	"	"	"	"	"	"	0.2	
"	156	"	"	"	"	"	"	"	"	"	0.4	
"	157	"	"	"	"	"	"	"	"	"	0.8	
"	158	"	CTY_6	"	0	-2 to 28	"	"	0	"	0.4	
" "	159 159A	" "	CTY_6 + Stovepipe	" "	" "	" "	" "	" "	" "	" "	" "	Bad zero return on Run 159.
"	160	S	P_6	"	-2 to 28	0	±10	"	"	–	–	
"	161	"	"	"	"	"	"	-10	"	–	–	
"	162	"	"	"	"	"	0	"	"	–	–	
"	163	"	"	"	"	"	±5	0	"	–	–	
"	164	"	"	"	"	"	"	-10	"	–	–	
"	165	"	"	60	-2 to 12	"	0	0	"	–	–	

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DATE 1951	RUN	CONFIGURATION	TEST	q_m	α_g °	ψ_g °	δ_a °	δ_e °	δ_r °	β °	T_c'	
10-30	166	S + P	CTP_6	60	-2 to 12	0	0	0	0	55	0	
"	167	"	"	"	"	"	"	"	"	"	.05	
"	168	"	"	"	"	"	"	"	"	"	-0.1	
"	169	"	"	"	"	"	"	"	"	"	-0.5	
"	170	WB_1VOMFC + P	HP_6	0to5	90	"	"	"	"	15	THRUST 175 lbs	
"	171	"	"	"	80	"	"	"	"	"	"	
"	172	"	"	"	"	"	"	10	"	"	"	
"	173	"	"	"	90	"	"	"	"	"	"	
10-31	174	"	"	"	"	"	"	20	"	"	"	
"	175	"	"	"	80	"	"	"	"	"	"	
"	175A	"	"	"	"	"	"	"	"	"	"	Missed q_m = 5 on Run 175
"	176	"	"	"	"	"	"	-10	"	"	"	
"	177	"	"	"	90	"	"	"	"	"	"	
"	178	"	"	"	"	"	"	30	"	"	"	
"	179	"	"	"	80	"	"	"	"	"	"	
"	180	"	"	"	90	"	±10	0	"	"	"	
"	181	"	"	"	"	"	"	10	"	"	"	
"	182	"	HY_6	"	0	90	0	0	"	"	"	
"	183	"	"	"	"	85	"	"	10	"	"	
"	184	"	"	"	"	"	"	"	"	"	"	

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10-31	185	$WB_1VOMFC + P$	HY_6	0to5	0	90	0	0	10	15	1751bs	
"	186	"	"	"	"	"	"	"	20	"	"	
"	187	"	"	"	"	85	"	"	"	"	"	
"	188	"	"	"	"	"	"	"	30	"	"	
"	189	"	"	"	"	90	"	"	"	"	"	
"	190	"	"	0	"	"	"	"	0	"	See Note	RPM =3000,4000, 5000,5500,6000
"	191	"	"	"	"	0	"	"	"	"	1751bs	
"	192	$WB_1VOMFC + P + GB$	"	0to5	"	90	"	"	"	"	"	
"	193	"	"	"	"	"	"	"	10	"	"	
"	194	"	"	"	"	"	"	"	20	"	"	
"	195	"	"	"	"	"	"	"	30	"	"	
"	196	"	"	"	"	"	"	"	0	$\beta_f=15$ $\beta_r=13$	"	
"	197	"	HP_6	"	90	0	"	"	"	15	"	
"	198	"	"	"	"	"	"	10	"	"	"	
"	199	"	"	"	"	"	"	20	"	"	"	
"	200	"	"	"	"	"	"	30	"	"	"	
"	201	"	"	"	"	"	"	-10	"	"	"	
"	202	"	"	"	"	"	"	40	"	"	"	
11-1	203	"	"	"	"	"	±10	0	"	"	"	
"	203A	"	"	"	"	"	"	"	"	"	"	

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11-1	204	$WB_1VOMFC + P + GB$	HP_6	0to5	90	0	± 10	10	0	15	175lbs	
"	205	"	"	"	80	"	0	0	"	"	"	
"	206	"	"	"	"	"	"	10	"	"	"	
"	206A	"	"	"	"	"	"	"	"	"	"	Bad zero return on Run 206
"	207	"	"	"	"	"	"	20	"	"	"	
"	208	"	"	"	"	"	"	30	"	"	"	
"	208A	"	"	"	"	"	"	"	"	"	"	Bad zero return on Run 208
"	209	"	"	"	"	"	"	40	"	"	"	
"	210	"	HY_6	"	0	85	"	0	30	"	"	
"	211	"	"	"	"	"	"	"	20	"	"	
"	212	"	"	"	"	"	"	"	10	"	"	
"	213	"	"	"	"	"	"	"	0	"	"	

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RUN-FIGURE REFERENCE

Run No.	Figure No.	Run No.	Figure No.
1	not presented	40	15
1A	not presented	41	not presented
2	not presented	42	not presented
2A	19,20	43	not presented
3	not presented	44	not presented
4	not presented	45	propeller calibration presented in Figures 1,2 and 3
5	20	46	
6	20	47	
7	not presented	48	
8	not presented	49	
9	18,19,20	49A	
10	not presented	50	
10A	not presented	51	
11	not presented	52	
12	19	53	
13	19	54	
14	19	55	
15	19	56	
16	not presented	57	
16A	19	58	
17	4,8,13,19	59	
18	5,8,13	60	
19	6,8,13,19	61	
20	7,8,13	62	
21	4,9	63	
22	5,9	64	
23	6,9	65	
24	7,9	66	
25,	4,10	67	
26	5,10	68	
27	6,10	69	46
28	7,10	70	46
29	4,11	71	22,27,31,36,39,46
30	not presented	72	24,27,33,36,39,46
30A	5,11	73	21,27,30,36,39,42,44
31	6,11	74	23,27,32,36,39,42,44
32	7,11	75	25,27,34,36,39,42,44
33	15	76	21,28,30,37,45
34	15	77	22,28,31,37,45
35	15	78	23,28,32,37,45
36	15	79	24,28,33,37,45
37	15	80	25,28,34,37,45
38	15	81	21,29,30,38
39	15	82	22,29,31,38

RUN-FIGURE REFERENCE (Cont'd)

Run No.	Figure No.	Run No.	Figure No.
83	23,29,32,38	116	not presented
84	24,29,33,38	116A	41
85	25,29,34,38	117	not presented
86	21,26,30,35,43	117A	41
87	22,26,31,35	118	47
88	23,26,32,35,43	119	not presented
89	24,26,33,35	119A	14
90	25,26,34,35,43	120	not presented
91	44	120A	14
92	44	121	not presented
93	44	121A	14
94	not presented	122	not presented
95	not presented	122A	not presented
96	not presented	122B	14
97	45	123	not presented
98	45	123A	14
99	45	124	not presented
100	43	124A	14
101	43	125	not presented
102	43	125A	14
103	39	126	not presented
104	39	126A	14
105	39	127	16
106	39	128	16
107	39	129	16
108	not presented	130	16
108A	not presented	131	16
108B	not presented	132	not presented
108C	41,42	132A	16
109	not presented	133	16
109A	41	134	16
110	not presented	135	14
110A	41,42	136	17
111	not presented	137	17
111A	41	138	17
112	not presented	139	17
112A	41,42	140	17
113	not presented	141	17
113A	41	142	17
114	not presented	143	17
114A	41	144	40,42
115	47	145	40
115A	41	146	40,42

RUN-FIGURE REFERENCE (Cont'd)

Run No.	Figure No.
147	40
148	40,42
149	40
150	40
151	40
152	40
153	40
154	13
155	13
156	13
157	13
158	not presented
159	not presented
160	18
161	18
162	18
163	18
164	18
165	12,20
166	12,19
167	12
168	not presented
169	12
170	48,52
171	49
172	49
173	48,52
174	48
175 175A	49
176	49
177	48
178	48
179	49
180	52
181	52
182	50
183	51
184	51
185	50
186	50
187	51
188	51
189	50
190	not presented
191	not presented
192	55
193	55
194	55
195	55
196	not presented
197	53,57
198	53,57
199	53
200	53
201	53
202	53
203	not presented
203A	57
204	57
205	54
206	not presented
206A	54
207	54
208	not presented
208A	54
209	54
210	56
211	56
212	56
213	56

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FIG. 1

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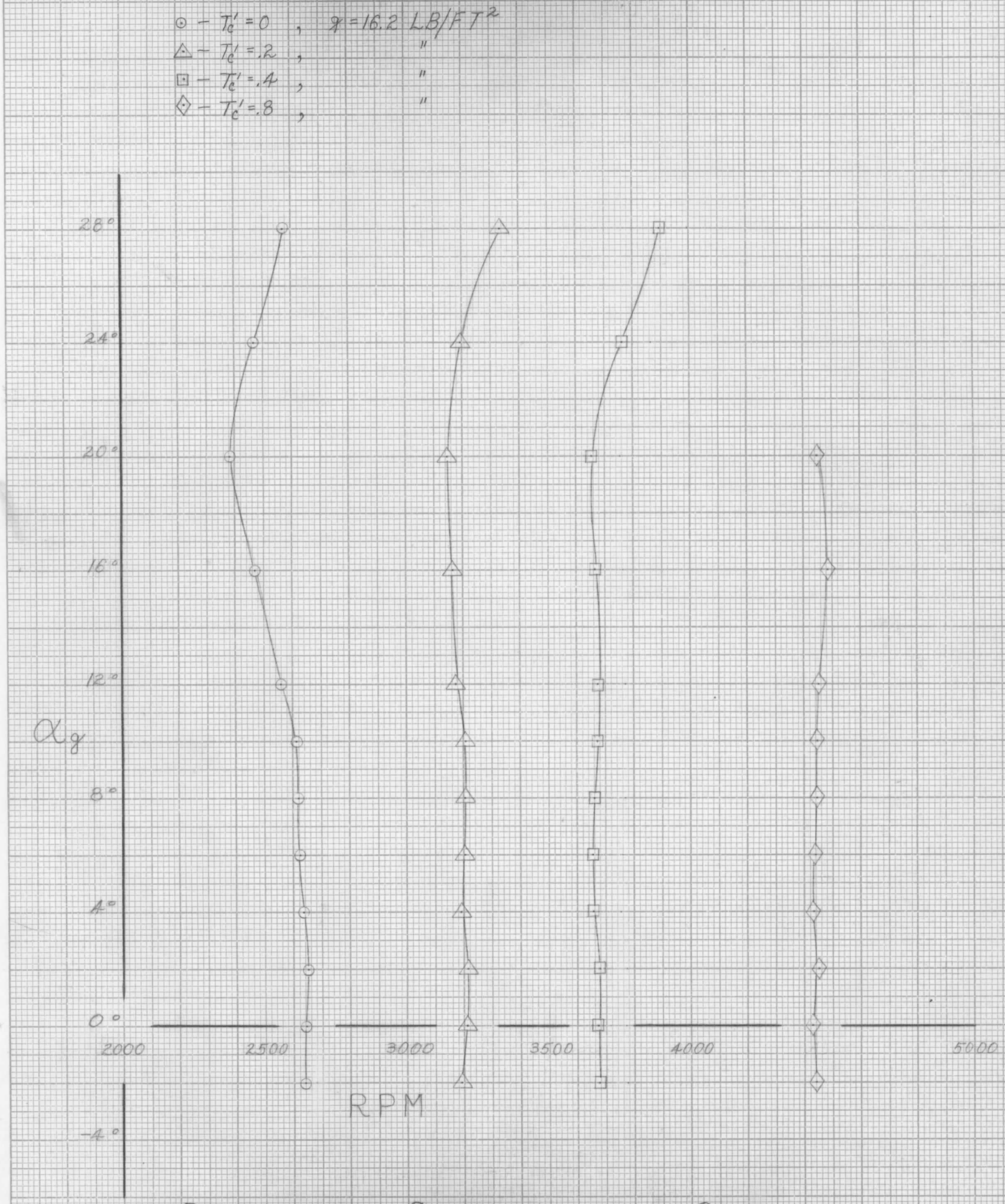

PROPELLER CALIBRATION, β = 25°
FOR PITCH RUNS IN LEVEL FLIGHT

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FIG. 2

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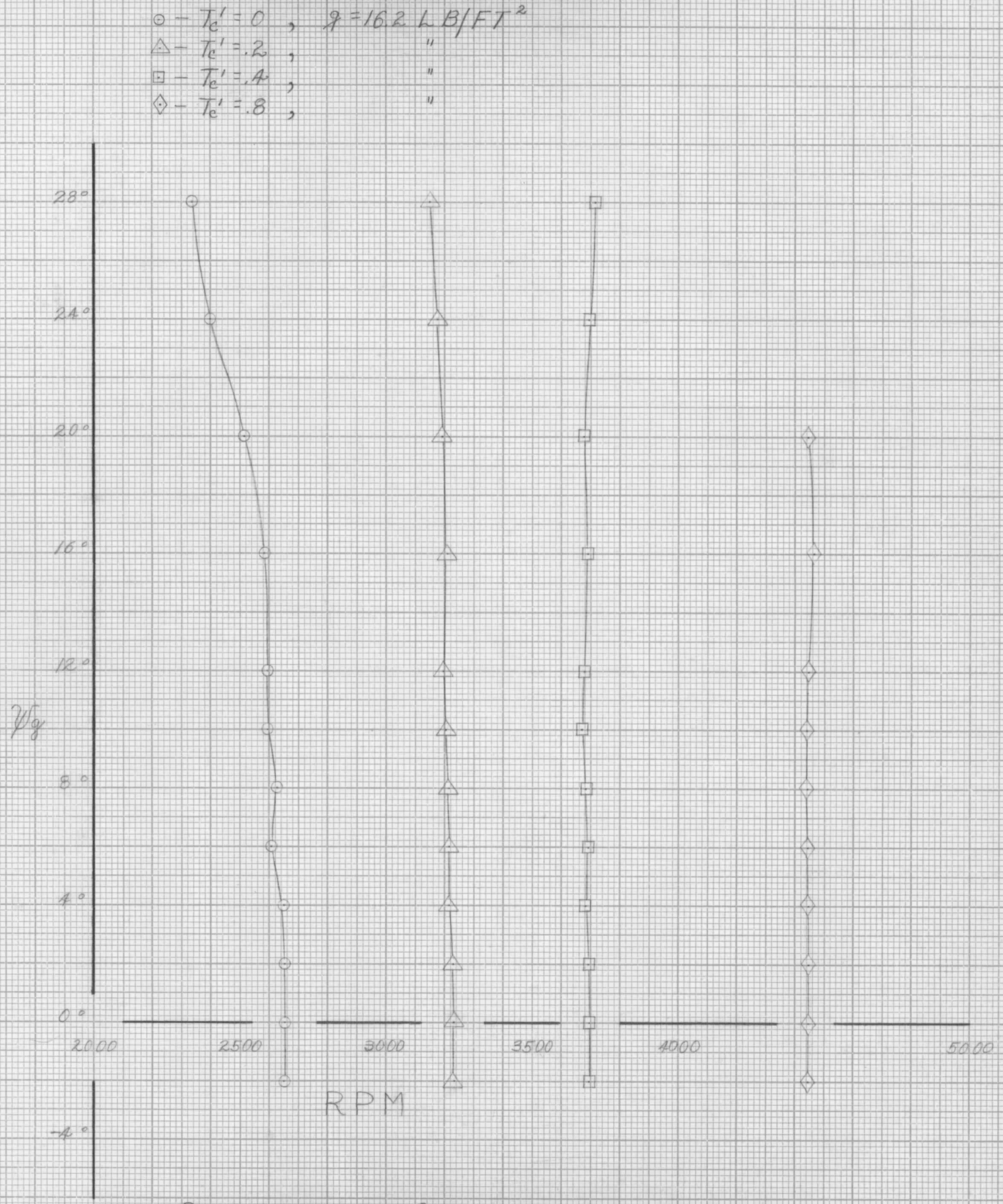

PROPELLER CALIBRATION, $\beta = 25°$
FOR YAW RUNS IN LEVEL FLIGHT

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FIG. 3

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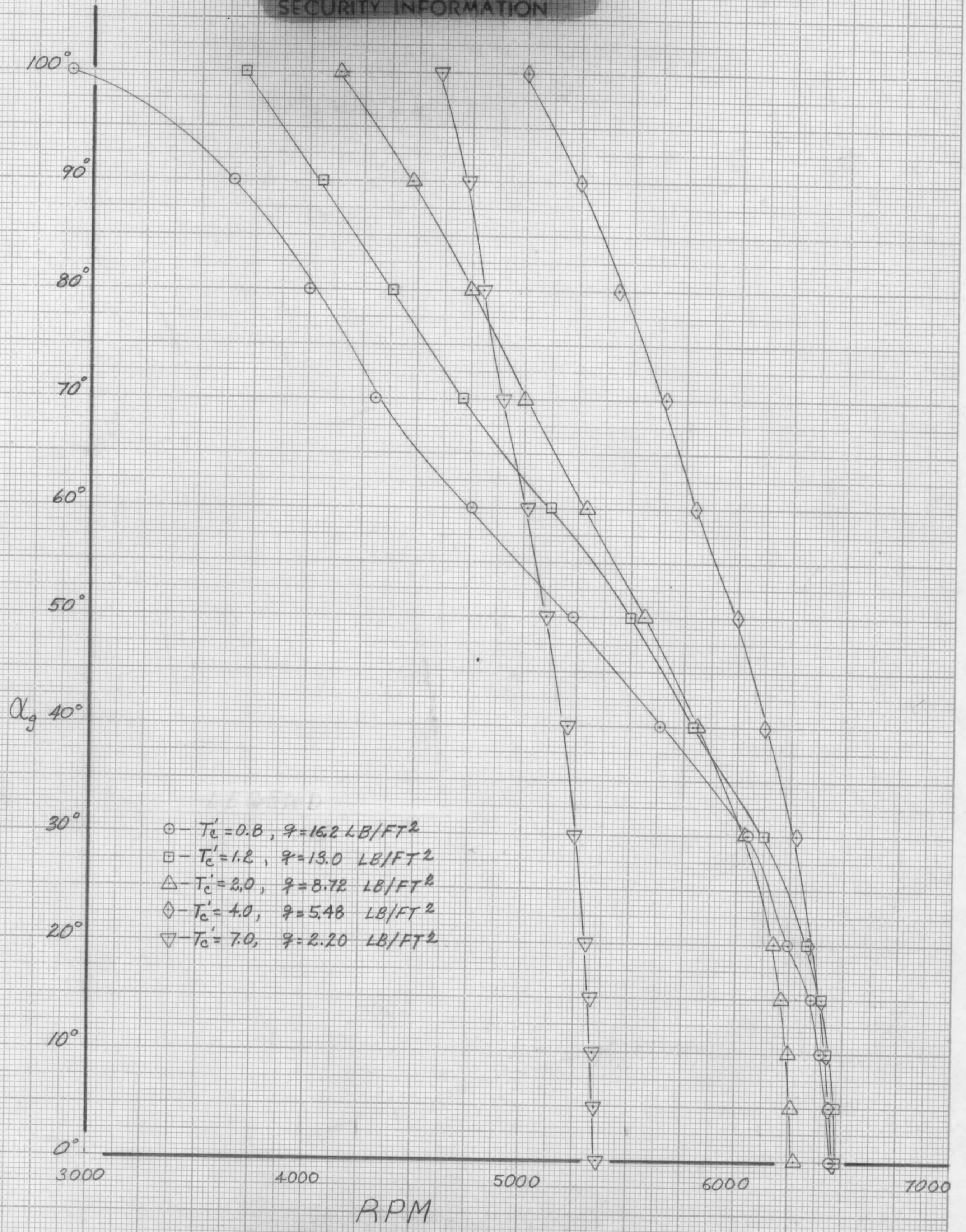

PROPELLER CALIBRATION, β = 15°
FOR PITCH RUNS IN TRANSITIONAL FLIGHT

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